

**State of California
AIR RESOURCES BOARD**

**Research Screening Committee Meeting
Cal/EPA Headquarters Building
1001 I Street
Conference Room 510, 5th Floor
Sacramento, California 95814
(916) 445-0753**

October 3, 2014

9:00 a.m.

ADVANCE AGENDA

I. Approval of Minutes of Previous Meeting:

July 17, 2014 meeting

II. Discussion of a New Research Project:

- 1) "Collection of Tractor-Trailer Activity Data," University of California, Riverside, \$500,000, Proposal No. 2782-281

In order to meet the greenhouse gas (GHG) emission reduction goals specified in California's Global Warming Solutions Act of 2006 (Assembly Bill 32, or AB32), GHG emission reductions are needed from heavy-duty tractors (HDT). The Tractor-Trailer GHG regulation adopted in 2012 was one of the discrete early action measures by the ARB to contribute to the goals of AB 32. The regulation applies to tractors pulling 53 foot or longer box trailers, and requires them to be equipped with aerodynamic technologies and low rolling resistance tires, but does not apply to other trailer types. The objective of this project is to investigate potential benefits of extending the regulation to other trailer types (e.g., flatbeds, tankers, etc.) and box trailers shorter than 53 feet. This objective will be accomplished by collecting tractor and trailer 'activity' data (e.g. vehicle miles traveled, average speed, etc.) using the following methods: 1) conducting tractor-trailer owner fleet surveys, and 2) collecting tractor-trailer activity data using on-board data loggers, followed by analysis of survey and data logger activity data. Results will support the development of second-generation GHG control measures for HDT trailers.

III. Discussion of Draft Final Reports:

- 1) "Evaluation of Pollutant Emissions from Portable Air Cleaners," Lawrence Berkeley National Laboratory, \$400,000, Contract No. 10-320

Portable air cleaners using newer technologies can generate primary and secondary emissions, such as formaldehyde, fine and ultrafine particles (UFP), and highly reactive oxygen species (ROS), such as hydroxyl radicals, which may lead to poor indoor air quality (IAQ) and associated health effects. In this study, the investigators measured primary emissions and secondary reaction byproducts from six air cleaners, including three photocatalytic oxidation (PCO) devices, a plasma generator, a ceramic heater/ionizer, and an antimicrobial heating device. Testing to assess their removal efficiency for volatile organic compounds (VOC) and particulate matter (PM) was conducted in a chamber first under clean air conditions and then challenged with VOC. Some of the tested devices were found to have significant removal efficiencies for some indoor air pollutants, while others were found to emit high levels of ozone, several VOC (e.g. toluene) as primary emissions, and to generate secondary byproducts, such as formaldehyde. In clean air, four of the devices showed measureable net VOC emissions. Devices that are intended to remove VOC removed just 8 percent to 29 percent of the VOC present. Only a PCO equipped with a HEPA filter and the plasma device removed PM, and ROS emissions were measureable but low. The investigators also used chamber-derived emission rates to model typical indoor levels and to assess occupant exposure by comparing predicted levels to California health based standards. They found that most emitted VOC were below health-based exposure standards, but in one modeling scenario, hazardous levels were exceeded for ozone, formaldehyde, and benzene. This research will help ARB determine whether there are any unhealthful emissions or performance concerns that need to be addressed in newer technology air cleaners. In addition, this research shows the need for the development of appropriate engineering controls to reduce the emissions of these pollutants and for the development of appropriate testing standards to assess hazardous air cleaner emissions other than ozone.

- 2) "On-Road Measurement of Emissions from Heavy-Duty Diesel Trucks; Impacts of Fleet Turnover and ARB's Truck and Bus Rule," University of California, Berkeley, \$300,012, Contract No. 09-340

In the absence of regulation, drayage trucks tend to be older vehicles with little or no emission controls. These vehicles congregate near ports and rail yards, and emit large amounts of smog forming nitrogen oxides (NO_x) and particulate matter (PM), impacting nearby communities by contributing to many adverse health effects, including asthma, cancer, and premature deaths. The Statewide Drayage Truck aims to reduce emissions from drayage trucks operating at major freight-handling facilities such as ports and rail yards by prohibiting the pre-1994 model year (MY) engines from entering such facilities after December 31, 2009. Phase 1 of the regulation also required use of diesel particle filter (DPF) emission control systems on all MY 1994-2006 and later engines; this requirement was phased in over a period extending from December 31, 2009 to December 31,

2012. Phase 2 of the regulation then required that all engines exceed MY 2007 California or Federal emission standards by December 31, 2013.

To assess the effectiveness of fleet modernization rules and DPF retrofits on emissions from in-use trucks, field measurements of truck emissions near the Port of Oakland were performed during 2011 and 2013 using high time resolution (1 Hz or faster) instrumentation to distinguish the exhaust plumes of individual trucks. Black carbon (BC) emissions were measured as an indicator of PM emissions. This study adds to an existing record of on-road emissions data for drayage trucks measured at the same site in 2009 and 2010. The results show that diesel emissions near the Port of Oakland decreased by 76 percent \pm 22 percent for BC and by 53 percent \pm 8 percent for NO_x from 2009 to 2013. The study also showed that while BC and NO_x emissions have decreased near the Port of Oakland, both nitrogen dioxide (NO₂) concentrations and NO₂/NO_x ratios increased due to the catalysts used in the DPF's. The fleet average NO₂ emissions will eventually be reduced as trucks equipped with selective catalytic reduction (SCR) systems are introduced at the Port in coming years, but it will take time because the drayage rule doesn't require MY2010 compliant engines until December 31, 2022.

- 3) "Cool California Carbon Challenge: A Pilot Intra-Inter-Community Carbon Footprint Reduction," University of California, Berkeley, \$300,004, Contract No. 10-325,

Achieving California's 2020 and 2050 climate goals will require voluntary reductions of residential greenhouse gas (GHG) emissions, as recently noted in the AB 32 Scoping Plan update. However, motivating behavioral change can be difficult: improved access to information does not generally suffice to motivate individuals and communities to adopt energy-saving behaviors, even when these behaviors are in the individuals' economic best interests. Competitions and community-based social marketing (including strategies such as goal-setting, modeling of normative behaviors, feedback, rewards, and tailored carbon footprint reduction recommendations) have demonstrated some success in motivating environmentally friendly behavior. This project conducted and evaluated a pilot carbon footprint reduction competition over a 13-month period in eight California communities, and enrolled 2,667 households. Over 900 participants manually entered more than 10,000 monthly electricity, natural gas and motor vehicle readings in the online software, far exceeding the level of participation anticipated at the outset of the program. Households who joined earlier in the program used less electricity than similar households that joined the program at a later date. The results suggest that inter-city competitions can be an effective tool to support California's efforts to curb residential GHG emissions.

- 4) "Quantifying the Comprehensive Greenhouse Gas Co-Benefits of Green Buildings," University of California, Berkeley, \$180,000, Contract No. 11-323

Buildings represent the second largest source of California's greenhouse gas (GHG) emissions when evaluating energy usage alone. Commercial buildings generated 10.8 percent of statewide GHG emissions in 2008. As California moves towards better quantifying greenhouse gas emissions reductions associated with

energy efficiency improvements in buildings, research was needed to fully account for the GHG emissions reductions associated with related improvements in the water, waste, and transportation components of building projects. The objective of this research was to develop a database of certified commercial green buildings in California that included performance metrics to measure GHG emission reduction co-benefits due to water savings, waste reduction, and minimized transportation impacts. This information will be useful in quantifying additional GHG emission reductions beyond energy savings in commercial buildings to assist with meeting long-term climate goals.

IV. Other Business:

- 1) Update on 2015/2016 Annual Research Plan